PROJECT SUMMARY SHEET

PROJECT TITLE: Upper Cheyenne River Watershed Assessment

NAME AND ADDRESS OF LEAD PROJECT SPONSOR:
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Hot Springs, SD 57747-2323

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STATE: South Dakota **WATERSHED**: Upper Cheyenne River **HUC #** 10120106, 10120107, 10120108

PROJECT TYPES: [ ] BASE [x] WATERSHED [ ] GROUNDWATER [ ] I&E

WATERBODY TYPES
[ ] Groundwater
[x] Lakes/Reservoirs
[x] Rivers
[x] Streams
[ ] Wetlands
[ ] Other

NPS CATEGORY
[x] Agriculture
[ ] Urban Runoff
[x] Silviculture
[ ] Construction
[ ] Resource Extraction
[ ] Stowage and Land Disposal
[ ] Hydrologic Modification
[ ] Other

SUMMARIZATION OF MAJOR GOALS:

The long-term goal of the Upper Cheyenne River Watershed Assessment is to locate and document sources of nonpoint source pollution in the watershed and produce feasible restoration recommendations. The project will provide information needed to develop a watershed implementation work plan with the objective of decreasing erosion and sedimentation rates in the watershed. This project will result in a TMDL report for the 303(d) listed segment of the Cheyenne River (i.e. Cheyenne River from Beaver Creek to Angostura Reservoir). The parameters of concern in this segment include conductivity, dissolved solids, and suspended solids.

PROJECT DESCRIPTION:

The Cheyenne River basin crosses the borders of three states – Wyoming, Nebraska, and South Dakota. Within all three states the Cheyenne River basin above Angostura Reservoir drains an area of approximately 23,300 km^2 (Beauvais, 2000). The Upper Cheyenne River Watershed Assessment study area is approximately 4,700 km^2 (1,159,000 acres) in Pennington, Custer, and Fall River Counties in South Dakota (Figure 1). Both the river and its tributaries have experienced declining water quality, which may be due to agricultural practices in the watershed.

This assessment is intended to be the initial phase of a watershed-wide restoration project. Through water quality monitoring, stream gaging, stream channel analysis, and land use analysis, the sources of impairment to the stream and the watershed will be documented and feasible alternatives for restoration will be presented in a final project report.

106 funds requested: $170,000
Other federal funds (Bureau of Reclamation): $385,200 **Total project costs: $555,200**

2.0 STATEMENT OF NEED

2.1 The purpose of the Upper Cheyenne River Watershed Assessment is to determine the sources of impairments, develop a TMDL, and to serve as the foundation of an implementation project for Cheyenne River above Angostura Reservoir. The study watershed drains into Angostura Reservoir and ultimately to the Missouri River. The streams in the study watershed contribute loadings of dissolved and suspended solids related to snowmelt or rainfall events.

2.2 The Cheyenne River from Beaver Creek to Angostura Reservoir is included on the 2002 State 303(d) list due to concentrations of conductivity, dissolved solids, and suspended solids that exceeded state standards. During 1996-1997, 38% of suspended solids samples and 43% of dissolved solids samples collected from South Dakota Department of Environment and Natural Resources Water Quality Monitoring (WQM) sites within the Upper Cheyenne River basin exceeded state water quality standards (SDDENR, 2002). The segment of the Cheyenne River from Angostura Reservoir to the mouth is also included on the 2002 State 303(d) list due to elevated suspended solids and fecal coliform bacteria concentrations. This portion of the river will be addressed in a future assessment.

2.3 The study watershed spans two major physiographic areas: the north and central portions of the watershed are in the Black Hills division of the Great Plains and the south portion is in the Pierre Hills division of the Great Plains (Kalvels, 1980 and Ensz, 1990). Land elevation ranges from about 3,160 to 7,015 feet above mean sea level (MSL).

Land use in the watershed is predominantly rangeland (77%) and forested land (21%) with some agricultural land (1%) according to the Geographic Information Retrieval Analysis System (GIRAS) data collected by the United States Geological Survey.

Major soil associations found in the watershed include Mathias-Butche-Rockoa, Paunsaugunt-Vanocker, Tilford-Spearfish, Kadoka-Orella-Bufton, Norka, Dailey-Ascalon, Pierre-Samsil, Minnequa-Grummit, Glenberg-Bankard, Lohmiller-Haverson, Grummit-Arvada, Canyon-Rockoa-Rock Outcrop, Nevee-Ypynevee-Rekop, Vanocker-Sawdust-Paunsaugunt, and Stovho-Trebor soil associations (Kalvels, 1980 and Ensz, 1990).

The average annual precipitation in the watershed is somewhat variable, both spatially and temporally, ranging from 16 in. (Fall River County) to 22 in. (Pennington County). Generally, average annual precipitation increases as you move north within the study watershed (Driscoll et al, 2000). Average seasonal snowfall for this region is approximately 42 in. (Kalvels, 1982).

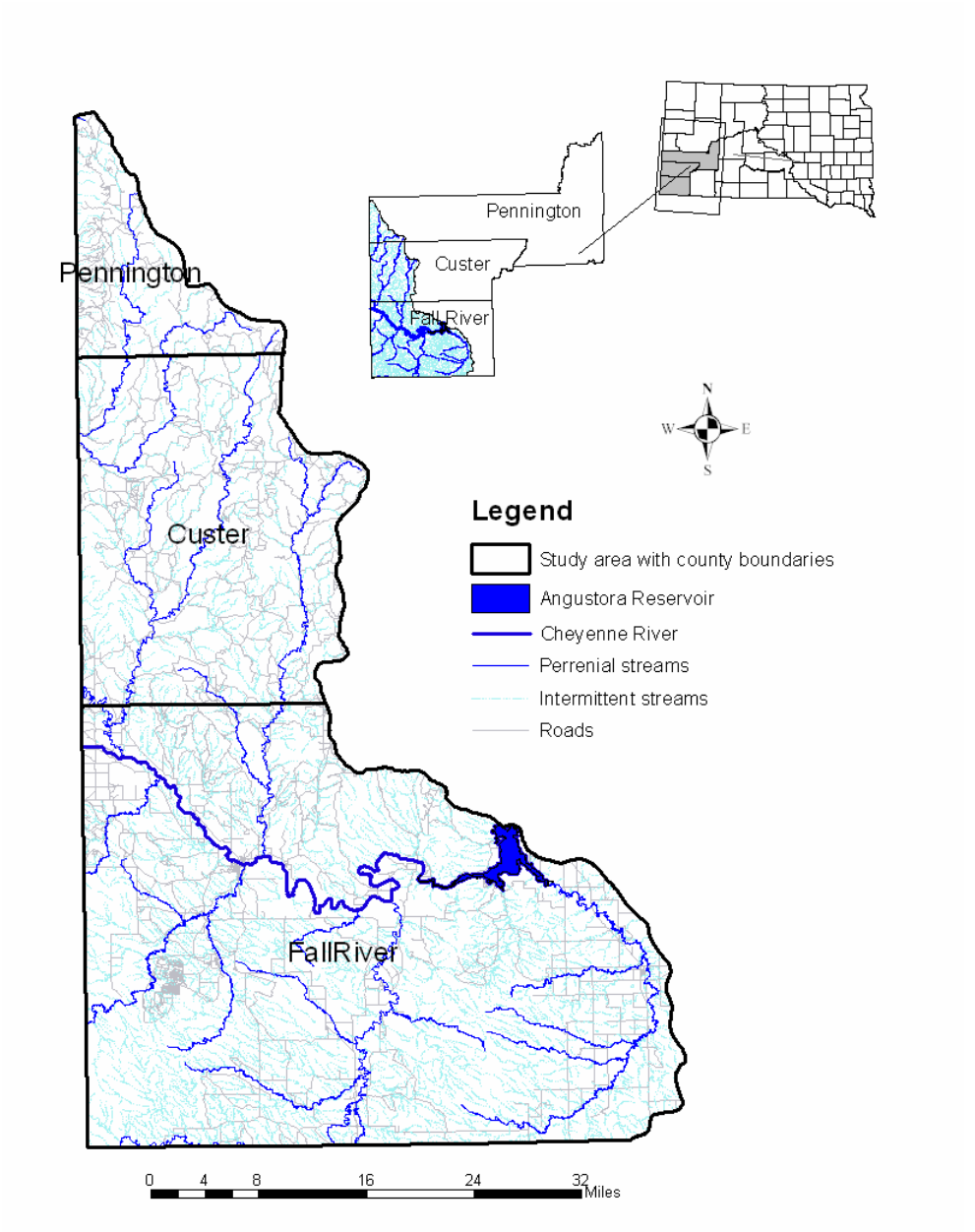

Figure 1. Location of the Upper Cheyenne River Watershed Assessment study area in Pennington, Custer, and Fall River Counties, South Dakota.

Urban areas are sparse within the study area. The city of Edgemont (population 867) is the largest municipality, and Oelrichs (population 145) is the second largest municipality within the Upper Cheyenne River watershed.

3.0 PROJECT DESCRIPTION

3.1 GOALS

The goal of this assessment project is to determine and document sources of impairments to the Upper Cheyenne River Watershed and to develop feasible recommendations for restoration. Critical areas of the watershed will be identified for implementation activities.

3.2 OBJECTIVES AND TASKS

Objective 1: Stream Sampling

Collect discharge measurements and water quality samples/measurements from the Cheyenne River and tributaries necessary to estimate water quality parameter loadings.

TASK 1 Water-level recorders will be installed at DENR-gaged sites, and maintenance of continuous stage recorders will continue for two years with exception of winter months if the water freezes. Three United States Geological Survey (USGS) stream gaging stations (USGS06400000, USGS6401500, and USGS06395000) are currently active within the project area at sites HC-2, CR-4 and CR-2, respectively (Figure 2). Current and historical USGS gage data will be used, where possible.

TASK 2 Discrete discharge measurements will be taken on a regular schedule (monthly) and during storm events for all DENR-gaged sites. Discharge measurements will be taken with either a hand-held current velocity meter under wadeable conditions or with a bridge crane during high flows using methods adapted by the USGS. Continuous records of stage will be obtained with digital recorders. Discharge measurements and stage records will be used to generate stage-discharge relationships.

Discharge measurements and water level data will be analyzed to develop flows for all water quality sampling times. Stage and discharge measurements will be used to update existing gaging station rating curves and develop relationships at new gaging locations. This information will be used with concentrations of sediment and nutrients to calculate loadings from the watershed.

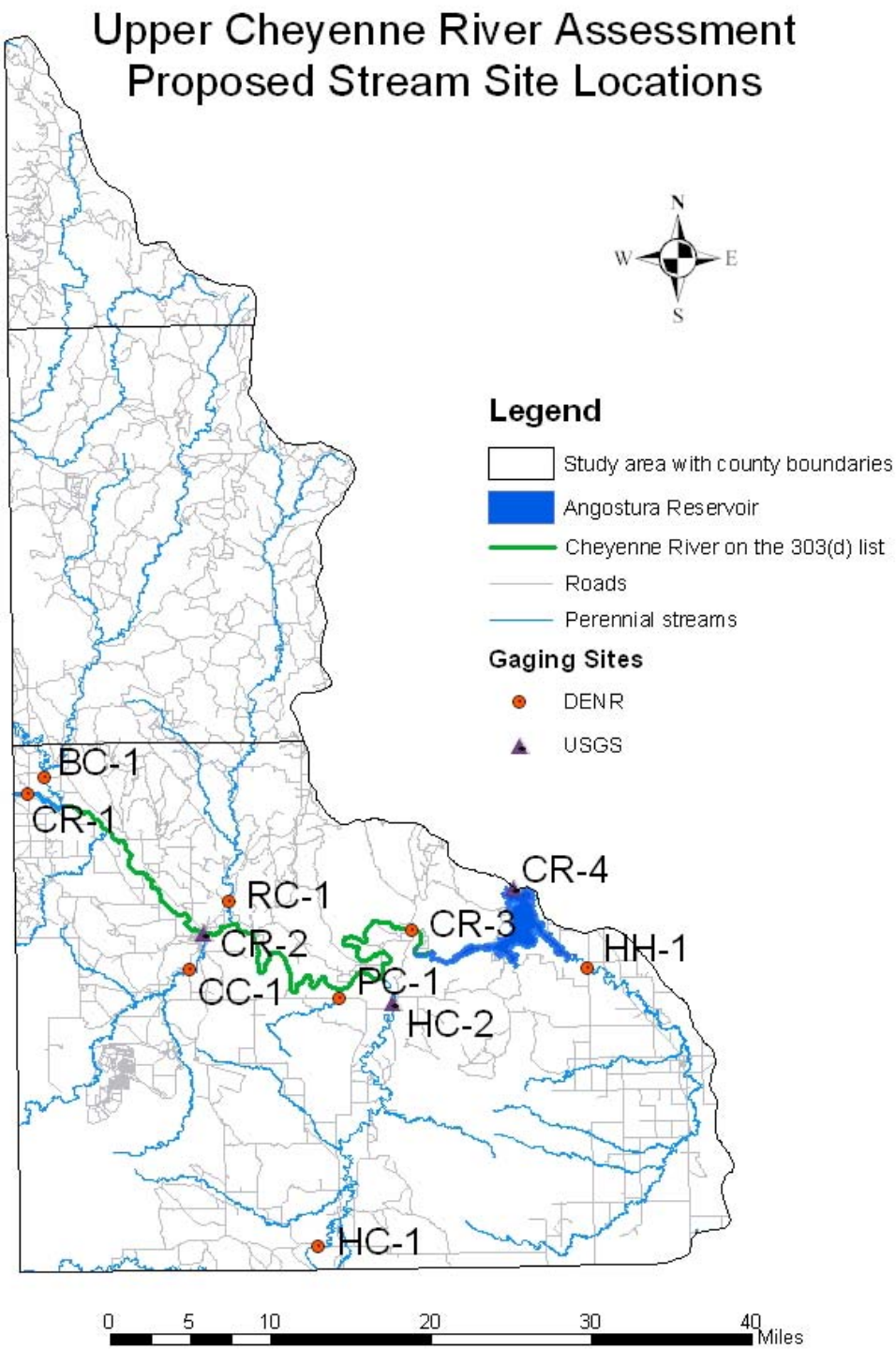

Figure 2. Locations of proposed stream sampling and gaging sites for the Upper Cheyenne River Watershed Assessment.

TASK 3 Water-quality samples will be collected from 11 stream sites (Table 1). Four sites on the mainstem of the Cheyenne River (CR-1, CR-2, CR-3, and CR-4) and seven tributary sites (BC-1, CC-1, HC-1, HC-2, HH-1, PC-1, and RC-1) will be sampled monthly for two years to collect base-flow data. Nine base-flow samples will be collected each year from each site. A total of 198 base-flow samples will be collected during the project period. Additional samples will be collected during spring runoff and select storm events. A total of 16 spring runoff and storm samples will be collected at each site (eight spring runoff and eight storm events) for a total of 176 during the project period. Two samples will be collected during the first week of spring snowmelt runoff and once a week thereafter, until runoff ceases, for a maximum of four supplemental spring runoff samples each year. The total number of baseflow and run-off samples at stream sites for the two year project period is estimated to be 374. The location of proposed stream monitoring sites may be found in Figure 2, and parameters to be collected are presented in Table 2.

Table 1. Proposed gaging sites for the Upper Cheyenne River Watershed Assessment.

Site ID	Stream Name	Location Description	DENR gaging	USGS gaging
BC-1	Beaver Creek	Beaver Creek west of Burdock, SD	X	
CC-1	Cottonwood Creek	Cottonwood Creek on Highway 471 south of Edgemont, SD	X	
CR-1	Cheyenne River	Cheyenne River near the Wyoming border	X	
CR-2	Cheyenne River	Cheyenne River at Edgemont, SD (USGS06395000)		X
CR-3	Cheyenne River	Cheyenne River near Hot Springs, SD	X	
CR-4	Cheyenne River	Angostura Reservoir outlet (USGS06401500)		X
HC-1	Hat Creek	Hat Creek near Edgemont, SD (USGS06400000)		X
HC-2	Hat Creek	Hat Creek near Ardmore, SD	X	
HH-1	Horsehead Creek	Horsehead Creek near the confluence with Angostura Reservoir	X	
PC-1	Plum Creek	Plum Creek near the confluence with the Cheyenne River	X	
RC-1	Red Canyon Creek	Red Canyon Creek on Highway 18 east of Edgemont, SD	X	

Three reference sites that represent the best attainable condition in the watershed will be established. Nine baseflow samples per site per year and eight run-off samples per site per year will be collected. A total of 102 reference samples will be collected during the two-year project.

Table 2. Parameters to be measured at stream sampling sites.

Biological Parameters	Physical/Field Parameters	Chemical Parameters
Fecal coliform bacteria	Water temperature	Alkalinity
E. coli	Air temperature	Ammonia as N
Macroinvertebrate communities	Dissolved oxygen	Nitrate + Nitrite as N
Periphyton communities	Field pH	Nitrogen, Total Kjeldahl (TKN)
Chlorophyll a (periphyton)	Specific conductance	Total dissolved phosphorus
Ash-free dry mass (periphyton)	Turbidity	Total phosphorus
	Stage	Total solids
	Flow	Total dissolved solids
	Visual observations	Total suspended solids
	Habitat assessment	Total volatile suspended solids
		Total organic carbon
		Calcium
		Magnesium
		Sodium
		Potassium
		Chloride
		Sulfate
		Hardness
		Trace elements (analyzed quarterly)*
		**SAR

* Trace elements, including Arsenic, Aluminum, Antimony, Barium, Beryllium, Boron, Cadmium, Cobalt, Chromium, Copper, Iron, Lead, Lithium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sulfur, Thallium, Vanadium, and Zinc will be analyzed quarterly.

** Calculated Value

Budget for Objective 1:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Stream Water Quality Sampling	$42,120	$4,500	$149,600*	$1,600	$38,000	$86,220

* Bureau of Reclamation is funding the water quality sample analysis

PRODUCTS:

Installation of eight gaging stations (Three tributary sites are already being gaged by USGS).

Bi-monthly discharge measurements will be collected at each site and stage discharge curves developed.

Three hundred seventy-four tributary water quality samples will be collected.

A water quality report will be produced, which will include a description of the relationship between chemical and physical data and the influence of the measured parameters on water quality.

A total of 102 reference site samples will be collected.

RESPONSIBLE AGENCIES:

Task Responsibilities:

Project Sponsor
U.S. Bureau of Reclamation

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

WORK ACTIVITIES:

Water samples will be collected with an isokinetic sampler to ensure a depth-integrated sample along the stream cross-section. When a depth-integrated sample cannot be collected (i.e. water depth < 1ft.), then grab sampling methods should be used. All samples will be collected using approved methods described in the State of South Dakota Water Resource Assistance Program Standard Operating Procedures for Field Samplers (WRAP SOP). After collection, sample bottles will be iced and delivered to an EPA-approved laboratory for analysis. Nutrient and solids parameters will be sampled at 11 tributary sites in the Upper Cheyenne River watershed. Water quality data will be integrated with hydrologic loading data to provide a complete analysis of the hydrologic system.

Objective 2: **Biological Sampling**

Characterize the biological communities within the Upper Cheyenne River watershed. This information will be used to develop a biological index to supplement assessment of water quality characteristics of the Upper

Cheyenne River watershed. The data will help determine if the water is meeting its beneficial use.

TASK 4 Benthic macroinvertebrate samples will be collected twice at each stream monitoring site and at three reference sites each year using methods described in the WRAP SOP. Reference sites will be selected that represent best attainable stream habitat and water quality within the study watershed. A total of 56 benthic macroinvertebrate samples will be collected.

Biological samples will be sent to an independent laboratory for taxonomic identification to the lowest level of taxonomic resolution.

A multimetric index will be used to analyze the macroinvertebrate community data. A suite of candidate metrics will be calibrated and a biological index will be developed to compare study sites to reference sites.

TASK 5 Periphyton samples will be collected twice at each stream monitoring site and at three reference sites each year. Reference sites will be selected that represent best attainable stream habitat and water quality within the study watershed.

Natural substrates will be sampled, where possible, for both community composition and estimates of algal biomass using methods described in the WRAP SOP.

Identification/enumeration samples will be sent to an independent laboratory for taxonomic identification to the genus level. Chlorophyll *a* samples will be analyzed by SD DENR in the Floyd L. Mathews Environmental Education and Training Center Laboratory, Pierre, SD. Ash-free dry weight samples will be analyzed by the BOR laboratory in Bismarck, ND.

TASK 6 Stream habitats will be assessed at study sites and reference sites using the WRAP SOP habitat assessment protocols. This assessment should occur in conjunction with the biological sampling (benthic macroinvertebrates and periphyton).

Stream habitat data will be compiled according to the WRAP SOP, and a stream habitat condition index will be developed to quantify overall stream habitat condition.

The project sponsor will also conduct a field reconnaissance to identify obvious impairments to stream channels and riparian zones within the Upper Cheyenne River watershed.

TASK 7 Fecal coliform bacteria samples will be collected at stream and lake sites. Samples will be collected for the enumeration of both *E. coli* and fecal coliform bacteria.

Budget for Objective 2:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Macroinvertebrate Sampling	$7,020	$300	$14,000	$1,120	$2,000	$24,440
Periphyton Sampling	$7,020	$300	$14,000	$1,120	$3,000	$25,440
Fecal Coliform Bacteria Sampling	$0	$0	$14,930	$410	$0	$15,360
Habitat Assessment	$7,020	$300	$0	$0	$1,000	$8,320
Total	**$21,060**	**$900**	**$42,930**	**$2,650**	**$6,000**	**$73,540**

PRODUCTS:

A total of 56 benthic macroinvertebrate samples collected, identified, and counted. Metrics will be developed for these samples.

A total of 56 periphyton, chlorophyll *a* and ash-free dry weight samples collected.

Stream habitat condition assessed at study and reference sites (14 sites).

RESPONSIBLE AGENCIES:

Task Responsibilities:

Project Sponsor

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

WORK ACTIVITIES:

Biological samples will be collected four times (twice per year) at stream sites, in accordance with the WRAP SOP, at 14 sites (11 study sites and 3 reference sites). Where the water depth is not appropriate for sampling the natural substrate, alternative-sampling techniques will be used. Biological samples will be sent to an independent laboratory for taxonomic identification to the lowest (most specific) level possible. The taxonomic data will be used to calculate a multimetric index of biological integrity.

Objective 3: Lake Assessment

Assess the current water quality of Angostura Reservoir. This information will be used to (1) determine whether or not water quality standards are being maintained, (2) estimate nutrient and sediment trapping, and (3) examine productivity levels (i.e. trophic state) for the reservoir.

TASK 8 Water quality parameters will be sampled at five locations in Angostura Reservoir (Figure 3). Table 3 lists the parameters to be measured at reservoir sites. Samples will be collected from surface and bottom depths once a month for a period of two years (excluding periods with unsafe ice cover). During June, July, and August, samples will be collected twice per month. Samples will not be composited in order to assess spatial variability within the reservoir. A total of 300 samples will be collected from the reservoir.

Ambient nutrient concentrations and trophic state will be assessed for Angostura Reservoir. Water column dissolved oxygen and temperature profiles will also be collected at each site on a monthly basis except during June, July, and August, when samples/measurements will be collected twice a month. All samples/measurements will be collected using methods described in the WRAP SOP.

TASK 9 Perform a macrophyte and shoreline survey of Angostura Reservoir. This task will be completed only once during the late summer months (July or August). Macrophytes will be sampled from the reservoir with a plant grapple/rake. A depth finder will be used to locate macrophyte beds and determine the area of coverage of submerged vegetation. Macrophyte density and species composition will be recorded.

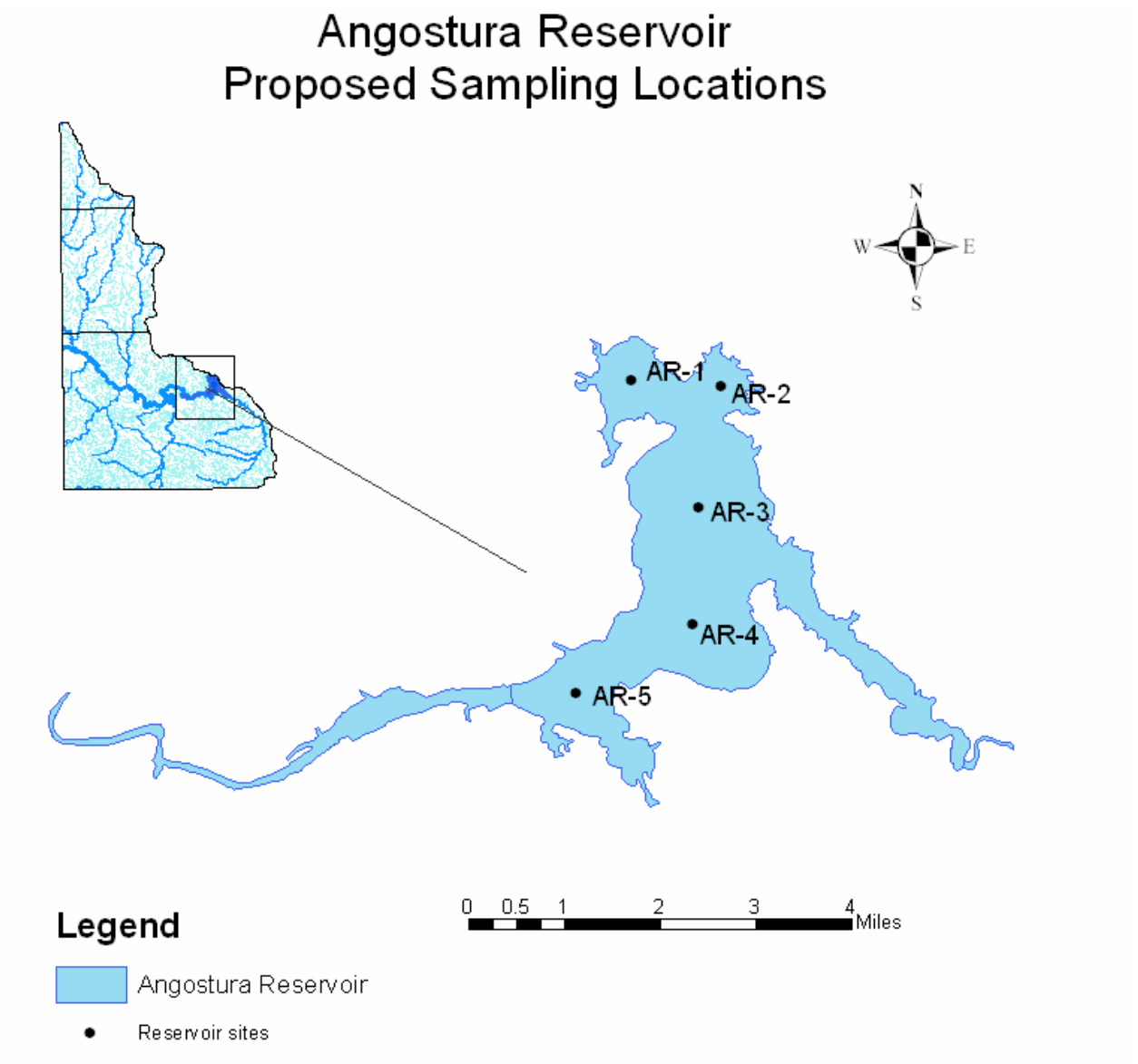

Figure 3. Proposed sampling locations for the assessment of Angostura Reservoir.

Table 3. Parameters to be measured at reservoir sampling sites.

Biological Parameters	Physical/Field Parameters	Chemical Parameters
Fecal coliform bacteria	Water temperature	Alkalinity
E. coli	Air temperature	Ammonia as N
Phytoplankton communities	Dissolved oxygen	Nitrate + Nitrite as N
Chlorophyll *a* (phytoplankton)	Field pH	Nitrogen, Total Kjeldahl (TKN)
Ash-free dry mass (phytoplankton)	Specific conductance	Total dissolved phosphorus
Submerged macrophytes	Turbidity	Total phosphorus
	Secchi depth	Total solids
	Water Depth	Total dissolved solids
	Visual observations	Total suspended solids
		Total volatile suspended solids
		Total organic carbon
		Calcium
		Magnesium
		Sodium
		Potassium
		Chloride
		Sulfate
		Hardness
		Trace elements (analyzed quarterly)*

* Trace elements, including Arsenic, Aluminum, Antimony, Barium, Beryllium, Boron, Cadmium, Cobalt, Chromium, Copper, Iron, Lead, Lithium, Manganese, Molybdenum, Nickel, Selenium, Silver, Sulfur, Thallium, Vanadium, and Zinc will be analyzed quarterly.

Budget for Objective 3:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Lake Assessment	$28,080	$450	$120,000*	$1,500	$1,500	$31,530

* Bureau of Reclamation is funding the water quality sample analysis

PRODUCTS:

A total of 300 reservoir samples will be collected.

A macrophyte and shoreline survey will be conducted once during the project.

RESPONSIBLE AGENCIES:

Task Responsibilities:

Project Coordinator
Project Sponsor
U.S. Bureau of Reclamation

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

Objective 4: **Quality Assurance/Quality Control**

Approved Quality Assurance/Quality Control procedures will be used to ensure that all samples are accurate and defendable.

TASK 10 For a minimum of 10 percent of all the water quality and biological samples collected, QA/QC samples will be collected. QA/QC samples will consist of field blanks and field replicate samples. An estimated 59 water quality QA/QC samples (35 stream samples and 24 reservoir samples) and 12 biological QA/QC samples (six macroinvertebrate samples and six periphyton samples) will be collected during the project. The collection of all field data will be accomplished in accordance with the WRAP SOP.

All QA/QC activities will be conducted in accordance with the Nonpoint Source Program Quality Assurance Project Plan.

The activities involved with QA/QC procedures and the results of QA/QC monitoring will be compiled and reported on in a section of the final project report and in all project quarterly progress reports.

Budget for Objective 4:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Quality Assurance/ Quality Control	$7,020	$0	Chemical: $23,600* Biological: $2,520	$400	$0	$9,940

* Bureau of Reclamation is funding the water quality sample analysis

PRODUCTS:

An estimated 94 QA/QC samples collected for tributary sites.

An estimated 60 QA/QC samples collected for reservoir sites.

An estimated 6 QA/QC samples each will be collected for macroinvertebrates, periphyton, ash-free dry weight, and chlorophyll *a*.

RESPONSIBLE AGENCIES:

Task Responsibilities:

Project Coordinator
Project Sponsor
Bureau of Reclamation

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

WORK ACTIVITIES:

Approved QA/QC will be used to collect all data for the Upper Cheyenne River Assessment project. Please refer to the South Dakota Non-point Source Program Quality Assurance Plan and the WRAP SOP for details of the procedures to be followed.

Objective 5: **Landuse Modeling**

Potential impacts of agricultural land uses on the water quality within the Upper Cheyenne River watershed will be evaluated using the Annualized Agricultural Non-Point Source (AnnAGNPS) model, a landuse simulation computer model.

TASK 11 Information will be gathered to define the physical characteristics of the watershed (topography, soils, geology, hydrology, etc.). Landuse information will also be collected.

AnnAGNPS model will be used to identify and prioritize critical areas of non-point source pollution within the study watershed and to estimate soil and nutrient loss and delivery from these critical areas.

The CONCEPTS model, or Conservational Channel Evolution and Pollutant Transport System model, may be used to simulate the stream channel and to evaluate the long-term impact of rehabilitation measures to stabilize the stream system and reduce sediment yield.

Budget for Objective 5:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Landuse Modeling	$7,020	$1,500	$0	$0	$5,000	$13,520

PRODUCTS:

Landuse data collected and analyzed for the prioritization of critical cells in the watershed.

RESPONSIBLE AGENCIES:

Task Responsibilities:

Project Coordinator
Project Sponsor

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

Objective 6: Public Participation and Involvement

TASK 12 Informational meetings will be held on a quarterly basis for the public and to inform the involved parties of progress on the study. Public participation and involvement will be encouraged. These meetings will provide an avenue for input from the residents in the area. Notification of meetings will be made to local agencies and newspapers. In addition, a public web page will be maintained to provide the public with the latest available data as well as an overview of the project and status of work activities.

TASK 13 News releases will be prepared and released to local news media on a quarterly basis. These releases will be provided to local newspapers, radio stations and TV stations.

TASK 14 Biannual progress reports will be completed and presented at the appropriate general public meetings to keep the involved parties up-to-date with work activities and ensure their timely completion.

Budget for Objective 6:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Public Participation	$7,020	$150	$0	$700	$0	$7,870

PRODUCTS:

8 Quarterly public meetings
8 News releases
Biannual progress reports for GRTS
Involvement and/or input from the public will be documented

RESPONSIBLE AGENCIES:

Task Responsibilities:

Project Coordinator
Project Sponsor

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

WORK ACTIVITIES:

Informational meetings will be held for the public to inform involved parties of progress on the study and provide a means of public input.

Objective 7: **Develop Final Report and TMDL Summary**

TASK 15 Document discharge measurements, water quality data, and methods used to calculate hydrologic budgets and pollutant loadings. Using the results of the landuse modeling, hydrologic and water quality budgets, and biological information, identify areas in the watershed that would require management practices.

TASK 16 Write a summary of historical water quality and landuse information and compare with project data to determine any possible trends. Write a summary report of all QA/QC activities conducted during the project and include in the final project report.

TASK 17 Write a description of feasible restoration recommendations for use in planning a watershed nonpoint source implementation project, and develop a TMDL for the listed segment of the Cheyenne River above Angostura Reservoir.

TASK 18 Based on the data and information compiled for the project, prepare a description of the physical, chemical, and biological condition of the river and its tributaries.

TASK 19 The final report and TMDL summary, drafted by the project sponsor, will be reviewed by SD DENR and the U.S. Environmental Protection Agency. A wrap-up period has been allotted for this review process, which will provide an opportunity to communicate with the project coordinator throughout the review process.

Budget for Objective 7:

Budget Category	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total Funds
Final Report	$38,880	$0	$0	$500	$0	$39,380

PRODUCTS:

A final project report incorporating all previously described objectives

RESPONSIBLE AGENCIES:

Task Prioritization:

Project Coordinator
Project Sponsor (Report published by South Dakota Department of Environment and Natural Resources)

Design and Technical Assistance:

South Dakota Department of Environment and Natural Resources

WORK ACTIVITIES:

A hydrologic budget and pollutant loadings will be calculated for the entire watershed. An extensive review and study of the historical and current data will be performed to determine which Best Management Practices and hydrologic restoration techniques are needed to improve water quality in the Upper Cheyenne River watershed. Graphic presentations of the data will be produced. Feasible restoration alternatives will be developed.

3.3 MILESTONE TABLE - see attached milestone.

3.4 No special permits are required to perform this assessment project.

3.5 Fall River County Conservation District is the appropriate lead project sponsor for this project, as a majority of the study area is within Fall River County. Three Conservation District boundaries fall within the watershed area: Fall River, Custer, and Pennington County Conservation Districts. The conservation districts are important to this project because of their relationship with watershed landowners.

4.0 COORDINATION PLAN

4.1 The following groups/agencies have agreed, through an informal agreement, to cooperate in the Upper Cheyenne River Watershed Assessment Project. These agencies are members of the assessment steering committee formed to advance the project and make project-related decisions.

SD Department of Environment and Natural Resources

Bureau of Reclamation

United States Geological Survey

Angostura Irrigation District

Black Hills Resource Conservation and Development Association, Inc.

Fall River County Conservation District

Custer County Conservation District

Pennington County Conservation District

4.2 Project activities will be coordinated with state, federal, and local government agencies through frequent personal communication and monthly meetings.

4.3 Currently, the Bureau of Reclamation is funding an investigation of nutrient dynamics and algae abundance in Angostura Reservoir, with a scheduled completion date of October 2004. The Bureau of Reclamation will provide water quality sample analysis for the proposed Upper Cheyenne River Assessment Project through their Technical Assistance Program.

5.0 EVALUATION AND MONITORING PLAN

5.1 The monitoring strategy is explained in Section 3. The project will produce biannual progress reports. The sampling and analysis procedures required to complete the tasks within Section 3 can be located in the State of South Dakota Water Resource Assistance Program Standard Operating Procedures for Field Samplers (WRAP SOP).

5.2 This assessment project consists of a combination of chemical, hydrologic, land use and biological analyses. Monitoring sites will be maintained and sampled on the Upper Cheyenne River and selected tributary watersheds. Ambient samples will be collected along with spring runoff and storm events. Stream discharge will be routinely measured. The chemical, physical, and biological parameters to be sampled during this project can be located in Tables 2 and 3. Loads will be calculated based on the samples and data collected with the approved methods identified in section 5.1. A TMDL summary report will be produced for the portion of the Cheyenne River from Beaver Creek to Angostura Reservoir.

5.3 All water quality monitoring will be done in accordance with the approved South Dakota Non-point Source Program Quality Assurance/Quality Control Project Plan and the (WRAP SOP).

5.4 Results from all water-quality monitoring efforts from the Upper Cheyenne River Watershed Assessment Project will be reported in the final project report. Data will be managed by the local project sponsor and the South Dakota Department of Environment and Natural Resources and maintained in a computer database. All sample data will ultimately be entered in the U.S. EPA STORET Program by the South Dakota Department of Environment and Natural Resources. This data will be used as the foundation of a Watershed Implementation Project proposal.

6.0 BUDGET

Upper Cheyenne River Watershed Assessment	Personnel	Travel	Sample Analysis	Supplies and Shipping	Equipment	Total 106 Funds	Total 319 Funds
Stream Water Quality Sampling	$42,120	$4,500	***$149,600 ****	$1,600	$38,000	$86,200	$20
Biological Sampling	$21,060	$900	$28,000	$2,240	$6,000	$27,060	$31,140
Fecal Coliform Sampling	$0	$0	$14,930	$410	$0	$13,840	$1,500
Lake Assessment	$28,080	$450	***$120,000 ****	$1,500	$1,500	$30,030	$1,500
Quality Assurance/ Quality Control	$7,020	$0	***Chemical: $23,600 **** Biological: $2,520	$400	$0		$9,940
Landuse Modeling	$7,020	$1,500	$0	$0	$5,000	$5,000	$8,520
Public Participation	$7,020	$150	$0	$700	$0	$7,870	$0
Final Report	$38,880	$0	$0	$500	$0		$39,380
Budget Category Totals	**$151,200**	**$7,500**	**$42,930**	**$7,350**	**$50,500**	**$170,000**	**$92,000**

* Bureau of Reclamation is funding the water quality sample analysis

7.0 PUBLIC INVOLVEMENT

See Section 3.2, Objective 6.

Table 4. Upper Cheyenne River Watershed Assessment Milestone Chart

Project Schedule - Milestone Chart	2003						2004												2005												2006		
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M
Objective 1: Stream Water Quality Sampling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Objective 2: Biological Sampling (see below)																																	
Fecal Coliform Bacteria Sampling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Macroinvertebrate Sampling	■		■										■		■																		
Periphyton Sampling	■		■										■		■																		
Habitat Assessment													■																				
Objective 3: Lake Assessment	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Objective 4: Quality Assurance/Quality Control	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Objective 5: Landuse Modeling	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■									
Objective 6: Public Participation			■			■			■			■			■			■			■			■			■						
Objective 7: Final Report																									■	■	■	■	■	■			
TMDL Review and Approval																															■	■	■

8.0 REFERENCES CITED

Beauvais, S.L. 2000. Angostura Unit water quality: historical perspectives and recommendations for future research. U.S. Geological Survey, Columbia Environmental Research Center, Columbia, MO.

Driscoll, Daniel G., Ghaith R. Hamade, and Scott J. Kenner. 2000. Summary of precipitation data for the Black Hills area of South Dakota, water years 1931-98: U.S. Geological Survey Open-File Report 00-329, 151 p.

Ensz, Edgar H. 1990. Soil survey of Custer and Pennington Counties, Black Hill parts, South Dakota. United States Department of Agriculture, Soil Conservation Service and Forest Service.

Kalvels, John. 1982. Soil survey of Fall River County, South Dakota. United States Department of Agriculture, Soil Conservation Service and Forest Service.

South Dakota Department of Environment and Natural Resources (SDDENR). 2002. The 2002 South Dakota Report to Congress. SDDENR, Pierre, SD.